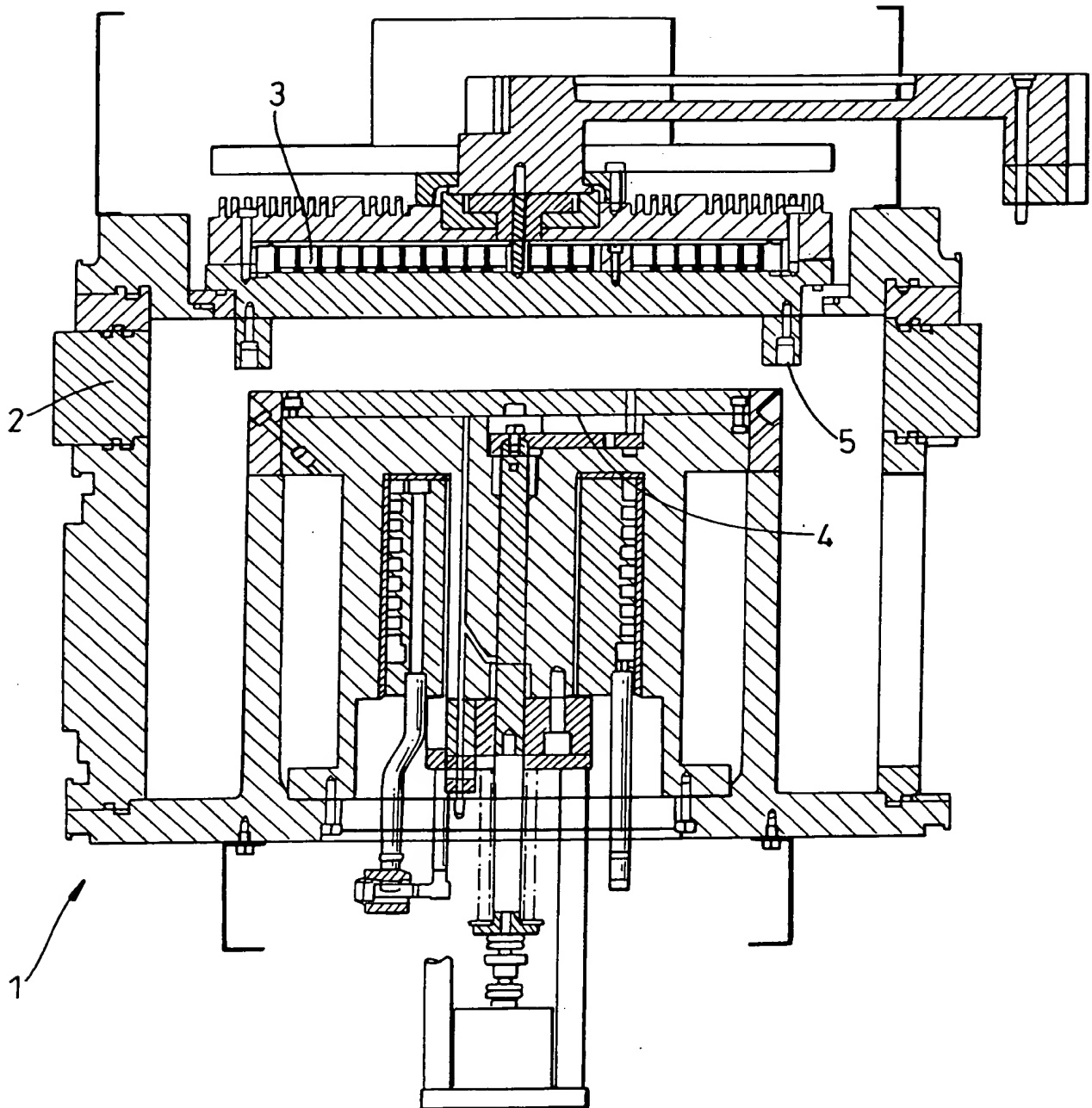
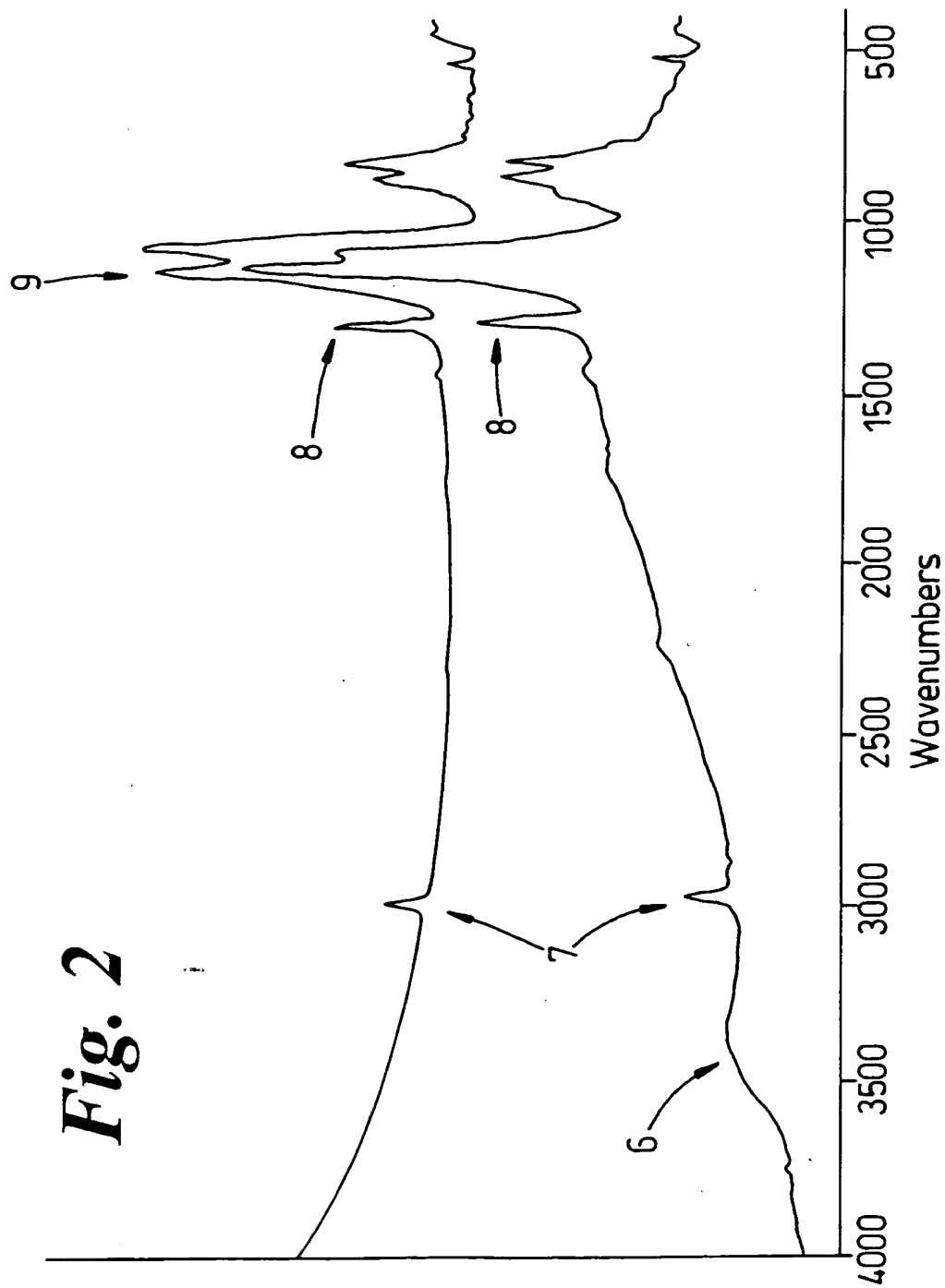


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*Fig 1*

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210/200 TMS/O₂ 2000MT 250 W 0°C PLATEN PRE AND POST ANNEAL

T0020-TN9E360

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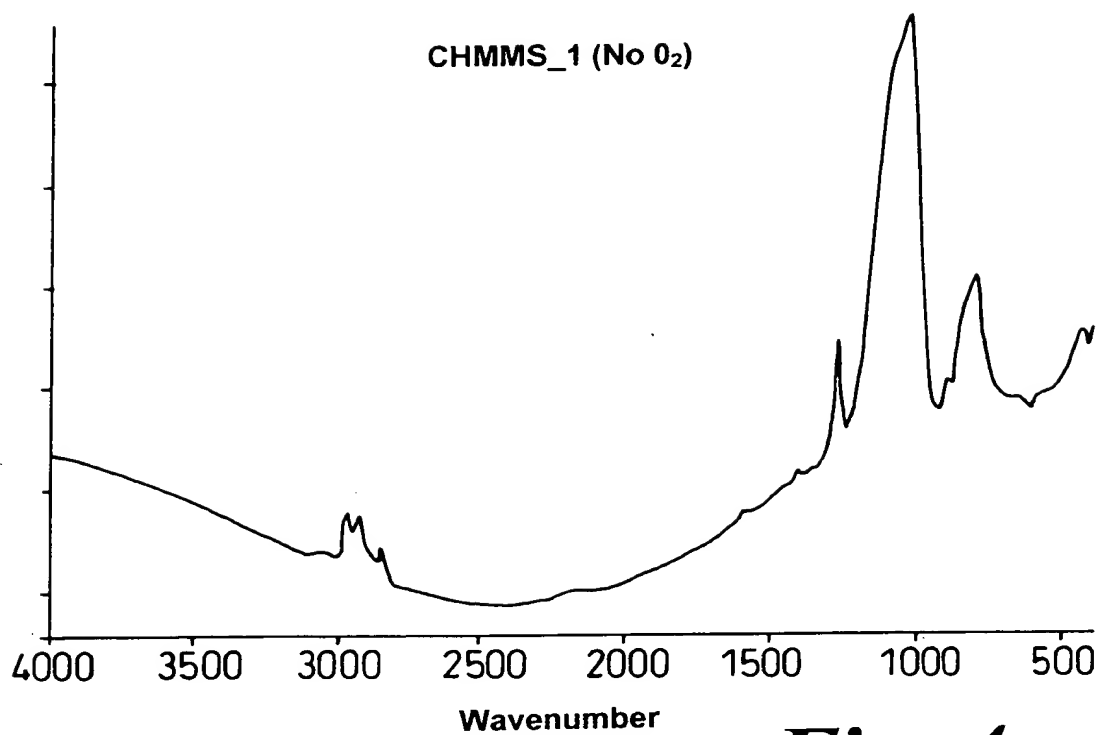
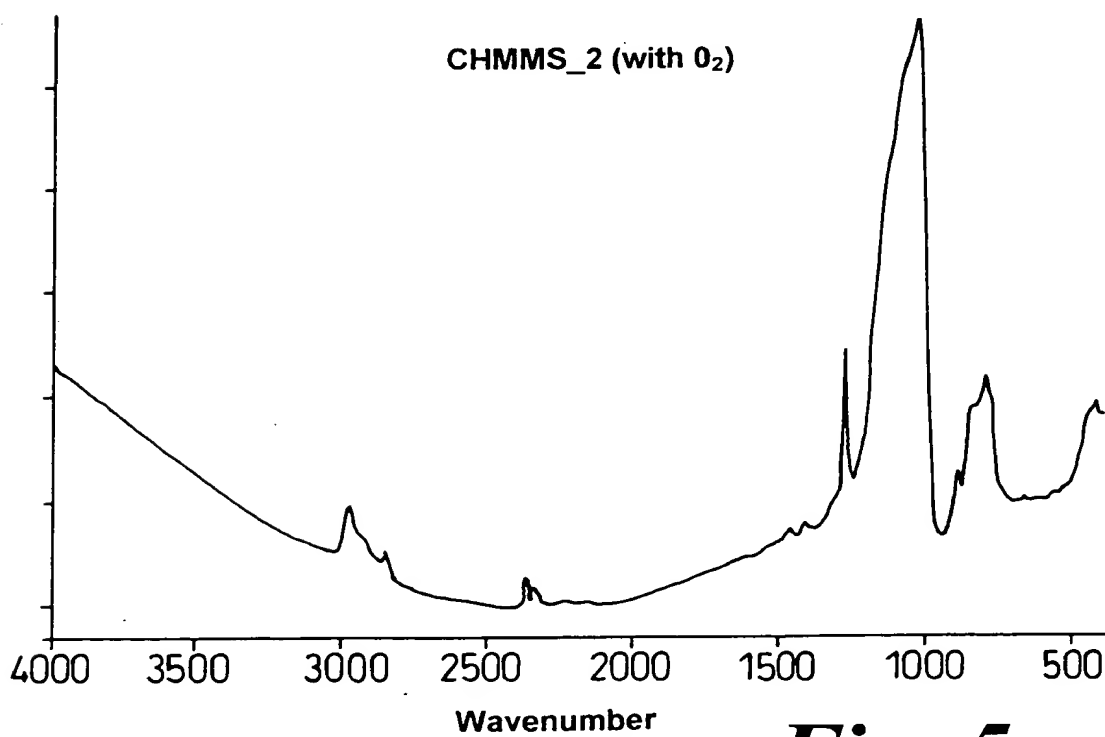
Fig. 3(a)



Fig. 3(b)

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*Fig. 4**Fig 5*

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T 4365460

Date	Run No	CHMMS	H ₂ O ₂	O ₂	N ₂	RF Power (W)	Pressure (mT)	Platen (°C)	S/head (°C)	Dep rate (Å/min)	Uniformity	Rj	Rj Range	SiC/SiO	SiH/SiO	CH/SiO	K
10/05/99	1	1000	0.75	0	0	50	1500	70	100	1166	6.6	1.482	0.0007				
	2	1300	0.75	0	0	50	900	70	100	681	5.1	1.3702	0.0074				
	3	1300	0.7	0	0	100	900	70	100	2542	6.5	1.3321	0.01				
	4	1300	0.7	0	0	100	900	70	100	1853	6.1	1.3676	0.015				
	6	1300	0.7	0	0	100	900	70	100	1450	8.5	1.3498	0.0125				
			0.7	0	0	100	900	70	100	3916	8.1	1.4736	0.0023				
	7	1300	0.7	0	0	100	900	70	100	2008	8.3	1.3587	0.0075				
										3965	22.1	1.5007					
	8	1300	0.7	0	0	100	900	0	100	2097	22.5	1.3749	0.005				
	9	1300	0.7	0	0	100	900	0	100	1392	13.5	1.4871	0.005				
	10	1300	0.7	0	0	200	900	5	100	716	13.9	1.374	0.005				
Pot Refilled 24/05/99	11	1300	0.7	0	0	200	900	0	100	1176	27.3	1.4831	0.0106	0.0343	0	0.1062	
										738	25.6	1.4064	0.025	0.0191	0	0.0069	
	12	800	0.5	0	0	100	900	70	100	1731	15.9	1.4618	0.0163				
	13	800	0.4	0	0	500	900	70	100	9938	35	1.458		0.0183	0.0063	0.1102	
	14	800	0.4	0	0	250	900	70	100	2166	16.2	1.4569	0.0156				
	15	800	0	0	0	500	900	70	100	-10000	-30	1.45		0.0316	0.021	0.1715	
	16	800	0	0	0	250	900	70	100	-6000	-45			0.0299	0.0365	0.2756	
	17	800	0	0	0	250	900	70	100					0.0322	0.0376	0.303	
	18	800	0	0	0	250	900	70	100	5200							2.55
	19	800	0	0	0	250	900	70	100	7200							2.5-2.7
	20	800	0	0	0	250	900	40	100	5338	23.4	1.4938		0.03	0.039	0.2353	
25/05/99	21	800	0	0	0	250	900	40	100	4200							3.2
	22	800	0	0	0	250	900	20	100	3641	14.4	1.4913	0.015	0.0396	0.027	0.237	
	23	800	0	0	0	250	900	20	100	6500							2.87

Fig. 6

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T06201436260

Flowfill chamber depositions using Cyclohexyldimethoxymethylsilane

P727 - Flowfill chamber (Flow _1), 40mm electrode gap - Syringe delivery system

Process Parameter

Bulk Film Properties

Run Number	CHMMS (g/min)	O ₂ Flow (Sccm)	N ₂ Flow (Sccm)	Pressure (mT)	Power (W)	Showhead (°C)	Platen (°C)	Dpp rate (Å/min)	Uniformity (%)	Refractive Index	Dielectric Constant	FTIR P.A.R.		Comment
												SIC/SIO	SIH/SIO	CH/SIO
1	0.65	0	0	900	250	100	50	7224	10.6	1.4819		0.0357	0.0111	0.1347
2	0.65	0	0	900	250	100	50					0.0345	0.0286	0.03672
3	0.65	0	100(1+8)	900	250	100	50	8190	6.5	1.4875		0.039	0.015	0.1545
4	0.65	0	50(1+8)	900	250	100	50	5810	22.8	1.4652		0.0354	0.0269	0.3499
5	0.65	0	50(1+8)	900	250	100	50	8289	13.1	1.51		0.0384	0.0107	0.131
6	0.65	0	50(1+8)	900	250	100	50	8906	4.47	1.5089		0.0379	0.0139	0.1238
7	0.65	0	100(1+8)	900	250	100	50	8717	2.37	1.4475		0.0364	0.0172	0.1886
8	0.65	0	100(1+8)	900	100	100	50	2789	9.2	1.4775		0.0349	0.0367	0.3518
9	0.65	0	100(1+8)	900	500	100	50	12748	3.4	1.489				
10	0.85	0	100(1+8)	900	500	100	50	14222	1.77	1.538				
11	0.85	0	200(1)	900	500	100	50	14192	1.5	1.5228				
12	0.85	0	200(8)	900	500	100	50	14282	1	1.5444				
13	0.85	0	100(1+8)	500	500	100	50	9790	3.7	1.4895				
14	0.85	0	100(1+8)	500	500	100	50	11382	6.2	1.4468				RI wafer
15	0.85	0	200(8)	900	500	100	50	19116	5.6	1.4634				RI wafer
16	0.65	0	100(1+8)	900	250	100	50	10242	6.6	1.4558				RI wafer
17	0.65	0	100(1+8)	900	250	100	50				3*			K=2.4 post oven anneal
18	0.85	0	200(8)	900	500	100	50				2.78*			* Left overnight before measurement
19	0.85	0	100(1+8)	500	500	100	50				2.82*			K=2.55 post oven anneal
20	0.65	0	100(1+8)	900	500	100	50				3.01*			
21	0.85	0	100(1+8)	900	500	100	50	7869	7.8	1.5144				Grainy film, 5min FTS
22	0.85	0	100(1+8)	900	500	100	50	15697	5.7	1.5387				5min FTS
23	0.85	0	100(1+8)	900	500	100	50	14751	3.5	1.4737				5min FTS
24	0.85	0	100(1+8)	900	500	100	50	14345	0.9	1.4737				10min FTS
25	0.85	0	100(1+8)	900	500	100	50	14079	1.6	1.4582				30min FTS
26	0.85	0	200(8)	900	500	100	50	18864	4.5	1.4332				5min FTS
27	0.85	0	200(8)	900	750	100	50	17841	7.2	1.4327				5min FTS
28	0.85	0	200(8)	900	250	100	50	11511	6.3	1.4263				5min FTS
29	0.85	0	200(8)	900	500	100	50	15565	3.5	1.4856		0.0317	0.0193	0.1366
30	0.85	0	200(8)	900	500	100	50	14807	3.1	1.4575		0.0336	0.0096	0.0785
31	0.85	0	200(8)	900	750	100	50	16898	3.8	1.503		0.0284	0.016	0.1418
32	0.85	0	200(8)	900	250	100	50	11658	11.5	1.499		0.0342	0.0338	0.3437
33	0.85	0	200(8)	900	500	100	50				2.56			Deposed with 30min FTS + Cap
34	0.85	0	200(8)	900	500	100	50				2.66			Deposed with 30min FTS
35	0.85	0	200(8)	900	500	100	50	17106	3.7	1.4552		0.0309	0.0199	0.1562
36	0.85	0	200(8)	900	500	100	50	17194	3.7	1.458		0.031	0.0202	0.1498
37	0.85	0	200(8)	1200	500	100	50	24708	2.2	1.5316		0.0311	0.0196	0.1338
38	0.85	0	200(8)	600	500	100	50	9953	1	1.5109		0.0353	0.018	0.1283
39	0.85	0	200(8)	600	250	100	50	7128	0.87	1.5296		0.035	0.0248	0.258
40	0.85	50	150(8)	900	250	100	50	9852	3.8	1.4575		0.0285	0.0162	0.2006
41	0.85	50	150(8)	900	500	100	50	18448	3.8	1.4209		0.0203	0.009	0.0839

Fig 7(Part 1 of 3)

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TABLE 7-36

Run Number	CHMMS (g/min)	O ₂ Flow (Scfm)	N ₂ Flow (Scfm)	Pressure (mT)	Power (W)	Showerhead (°C)	Platen (°C)	Dep rate (Å/min)	Uniformity (%)	Refractive Index	Dielectric Constant	SiC/SiO	FTIR P.A.R. SiH/SiO	CH/SiO	Comment
42	0.85	50	250(8)	900	500	100	50	~1.8µm	-	-	-	0.0209	0.0058	0.0572	Entire film cloudy
43	0.85	200	0	900	500	100	50	17888	5.2	1.3978	-	0.0161	0.003	0.0356	Powder stripes
44	0.85	50	150(8)	900	1000	100	50	17896	6.4	1.5031	-	0.0145	0.0068	0.0588	Hazy powder
45	0.85	0	200(8)	800	250	100	50	8213	3.4	1.4669	-	0.0378	0.0164	0.2189	RI Wafer
46	0.85	0	200(8)	800	250	100	50	9912	8.2	1.4649	-	-	-	-	RI Wafer
47	0.85	0	200(8)	1200	100	100	50	1792	29.2	1.4635	-	-	-	-	RI Wafer
48	0.85	0	200(8)	600	250	100	50	10233	3.3	fix	-	0.0387	0.0516	0.3823	No FTS
49	0.85	0	200(8)	600	250	100	50	-	-	-	2.56	-	-	-	5min FTS, no cap
50	0.85	0	200(8)	900	250	100	50	-	-	-	2.72	-	-	-	Water thin, 1st of day, 5min FTS, Cap
51	0.85	0	200(8)	900	250	100	50	-	-	-	3.16	-	-	-	No FTS
52	0.85	0	200(8)	900	250	100	50	-	-	-	2.33	-	-	-	30min FTS, Cap
53	0.85	0	200(8)	900	250	100	50	13034	5.7	fix	-	0.0371	0.0532	0.3933	No FTS
54	0.85	0	200(8)	900	250	100	50	13929	5.7	fix	-	0.0367	0.0599	0.3885	No FTS
55	0.85	0	200(8)	900	250	100	50	11131	7.7	fix	-	0.0368	0.0135	0.151	5min FTS
56	0.85	0	200(8)	900	250	100	50	9809	4.9	fix	-	0.0376	0.0101	0.0785	30min FTS
57	0.85	0	200(8)	900	250	100	50	9853	3.4	fix	-	0.0363	0.0082	0.0583	60min FTS
58	0.85	0	200(8)	900	250	100	50	-	-	-	2.62	-	-	-	5min FTS, no cap
59	0.85	0	200(8)	900	250	100	50	-	-	-	2.55	-	-	-	30min FTS, no cap
60	0.85	0	200(8)	900	250	100	50	-	-	-	2.52	-	-	-	60min FTS, no cap
61	0.85	0	200(8)	900	250	100	50	13020	8.1	1.5351	-	0.0374	0.0551	0.3939	No FTS
62	0.85	0	200(8)	900	250	100	50	12601	7.2	1.5658	-	0.0367	0.0573	0.3911	No FTS
63	0.85	0	200(8)	900	250	100	50	12450	6.5	1.4763	-	0.0322	0.02	0.2575	5min FTS @500°C
64	0.85	0	200(8)	900	250	100	50	11885	4.2	1.4466	-	0.0345	0.0126	0.1847	30min FTS @500°C
65	0.85	0	200(8)	900	250	100	50	10679	13?	1.5553	-	0.0373	0.0102	0.109	60min FTS @500°C
66	0.85	0	200(8)	900	250	100	50	-	-	-	2.93	-	-	-	5min FTS @500°C no cap
67	0.85	0	200(8)	900	250	100	50	-	-	-	2.97	-	-	-	5min FTS, cap @500°C
68	0.85	0	200(8)	900	250	100	50	-	-	-	2.61	-	-	-	60min FTS, cap @500°C
69	0.85	0	200(8)	900	500	100	50	17388	4.2	1.4207	-	0.0333	0.0111	0.094	30min FTS
70	0.85	0	200(8)	900	500	100	50	17484	3.8	1.4146	-	0.0323	0.0103	0.0825	60min FTS
71	0.85	0	200(8)	900	500	100	50	-	-	-	2.55	-	-	-	30min FTS, cap
72	0.85	0	200(8)	900	500	100	50	-	-	-	2.53	-	-	-	60min FTS, cap
73	0.85	50	200(8)	900	250	100	50	9869	4.3	1.4218	-	0.0306	0.0073	0.0635	5min FTS (centre cracks)
74	0.85	50	150(8)	900	250	100	50	9564	4.2	1.3767	-	0.0299	0.0064	0.0403	30min FTS no cracks
75	0.85	50	150(8)	900	250	100	50	-	-	-	2.26	-	-	-	30min FTS, cap
76	0.85	0	200(8)	900	250	100	50	13971	8	1.4022	-	-	-	-	RI Wafer
77	0.85	0	200(8)	900	250	100	50	12355	8.3	1.4308	-	-	-	-	RI Wafer
78	0.85	50	150(8)	900	250	100	50	11928	6.1	1.4115	-	-	-	-	RI Wafer
79	0.85	50	150(8)	900	250	100	50	11070	6.9	1.3942	-	-	-	-	RI Wafer
80	0.85	0	200(8)	900	500	100	50	25340	7.4	1.4493	-	-	-	-	RI Wafer
81	0.85	0	200(8)	900	500	100	50	22157	6.5	1.4307	-	-	-	-	RI Wafer
82	0.85	0	200(8)	900	500	100	50	17612	3.4	1.4354	-	-	-	-	5min FTS
83	0.85	0	200(8)	900	500	100	50	17736	2.7	1.5128	-	-	-	-	No FTS
84	0.85	0	200(8)	900	500	100	50	14636	2.4	1.4463	-	-	-	-	30min FTS
85	0.85	0	200(8)	900	500	100	20	21774	6.8	1.5393	-	0.0343	0.3071	0.3071	30min FTS (peeled off)
86	0.85	0	200(8)	900	500	100	20	-	-	-	-	0.036	0.079	0.079	60min FTS (peeled off)
87	0.85	0	200(8)	900	500	100	20	-	-	-	-	0.0349	0.0749	0.0749	60min FTS (peeled off)
88	0.85	0	200(8)	900	500	100	20	-	-	-	2.43	-	-	-	-

Fig 7 (Part 2 of 3)

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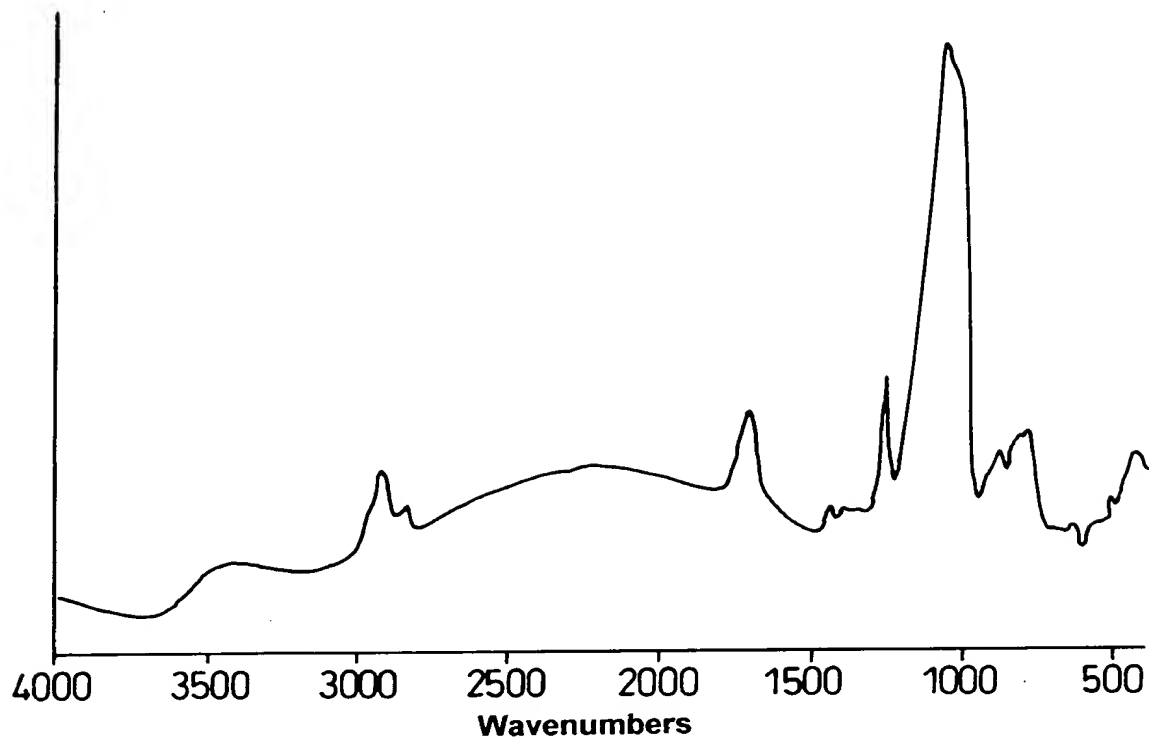
T0020-1795250

Run Number	CHMMS (g/min)	O ₂ Flow (Sccm)	N ₂ Flow (Sccm)	Pressure (mT)	Power (W)	Showerhead (°C)	Platen (°C)	Dep rate (Å/min)	Uniformity (%)	Refractive Index	Dielectric Constant	SIC/SIO	FTIR P.A.R. SIC/SIO	CH/SIO	Comment
89	0.85	0	200(8)	900	500	100	50	17344	2.4	1.4129		0.0341	0.0103	0.1051	
90	0.85	25	175(8)	900	500	100	50	17840	1.9	1.4398		0.027	0.0075	0.0776	Feint powder s/h
91	0.85	25	175(8)	900	250	100	50	9278	2.4	1.3875		0.0327	0.0079	0.0725	
92	0.85	50	150(8)	900	250	100	50	9663	5.9	1.3646		0.0308	0.0065	0.0456	Small amount of centre cracking
93	0.85	50	0	900	500	100	50	~10000				0.0344	0.0079	0.0532	Massive centre cracking
94	0.85	50	0	900	500	100	50	21408	4.6	1.4189		0.0273	0.0076	0.0725	
95	0.85	50	150(8)	900	250	100	50				2.49				30min FTS, cap
96	0.85	50	150(8)	900	250	100	50				2.48				30min FTS, cap
97	0.85	25	175(8)	900	250	100	50	9917	8.8	1.4521		0.0342	0.0093	0.1091	5min FTS
98	0.85	25	175(8)	900	250	100	50	9848	11.7	1.4592		0.0334	0.0117	0.1441	5min FTS
99	0.85	25	175(8)	900	250	100	50				2.437				5min FTS, cap
100	0.85	25	175(8)	900	250	100	50				2.286				60min FTS, cap
101	0.85	25	175(8)	900	250	100	50				2.426				30min FTS, cap
102	0.43	0	100(8)	900	500	100	50	12080	7.6	1.5107		0.0239	0.0093	0.096	5min FTS Showerhead dots
103	0.43	0	100(8)	900	500	100	50	12502	5.1	1.5081		0.025	0.0119	0.0116	5min FTS Showerhead dots
104	0.64	0	150(8)	900	500	100	50	20470			2.9				30min FTS cap
105	0.85	0	400(8)	900	750	100	50	14074	3.5	1.4983		0.0282	0.0148	0.0912	5min FTS
106	0.85	0	400(8)	900	750	100	50	13930	2.4	1.496		0.0278	0.0143	0.0771	30min FTS
107	0.85	0	400(8)	900	750	100	50				2.72				30min FTS CAP
CHAMBER SPACING CHANGED TO 20MM															
108	0.85	0	200(8)	900	500	100	50	17626		1.3437					30min FTS
109	0.85	0	200(8)	900	500	100	50	21765	8.4	1.3654					30min FTS, RI Wafer
110	0.85	25	175(8)	900	250	100	50	11438	17.6	1.3713					30min FTS
111	0.85	25	175(8)	900	250	100	50	12828	13.6	1.3888					30min FTS, RI Wafer
112	0.85	0	200(8)	600	500	100	50	14280	11.1	1.447					30min FTS, RI Wafer
113	0.85	0	200(8)	600	500	100	50	12185	3.4	1.3756					30min FTS
114	0.85	0	200(8)	400	500	100	50	9049	2.8	1.4745					30min FTS
115	0.85	0	200(8)	400	500	100	50	10620	8.6	1.4549					30min FTS, RI Wafer
116	0.85	0	200(8)	400	500	100	50	9073	3.5	1.4524		0.0255	0.0143	0.0724	30min FTS
117	0.85	0	200(8)	900	500	100	50	14852	2.3	1.4384		0.0343	0.0096	0.0865	30min FTS
118	0.85	0	200(8)	900	500	100	50				2.556				30min FTS, Cap
119	0.85	0	200(8)	400	500	100	50				2.76				30min FTS, Cap
120	0.85	0	200(8)	900	500	100	50	11633		1.4334		0.0363	0.0094	0.0751	30min FTS, Stress=8.78E8T
121	0.85	0	200(8)	900	250	100	50	8613		1.399		0.0386	0.0091	0.01019	30min FTS, Stress=7.31E8T
122	0.85	25	175(8)	900	250	100	50	9207		1.3954		0.0329	0.0069	0.0493	30min FTS, Stress=9.85E8T
123	0.85	50	150(8)	900	250	100	50	10515		1.381		0.0313	0.007	0.0502	30min FTS, Stress=9.32E8T
124	0.85	15	185(8)	900	250	100	50	10840		1.3807		0.034	0.0051	0.0556	30min FTS, Stress=9.041E8T
125	0.85	75	125(8)	900	250	100	50	11727		1.3597		0.0295	0.0042	0.0344	30min FTS, Stress=8.544E8T
126	0.85	100	100(8)	900	250	100	50	12598		1.3481		0.0293	0.0056	0.0336	30min FTS, Stress=8.778E8T
127	0.85	25	175(8)	900	250	100	50	9206		1.3718		0.0331	0.0061	0.0466	30min FTS, Stress=8.025E8T
128	0.85	15	185(8)	900	250	100	50				2.414				30min FTS
129	0.85	75	125(8)	900	250	100	50				2.4				30min FTS
130	0.85	100	100(8)	900	250	100	50				2.49				30min FTS
131	0.85	25	175(8)	900	250	100	50				2.41				30min FTS
132	0.85	35	165(8)	900	250	100	50				2.48				30min FTS
133	0.85	15	185(8)	900	250	100	50				2.43				30min FTS
134	0.85	30	170(8)	900	250	100	50				2.45				30min FTS

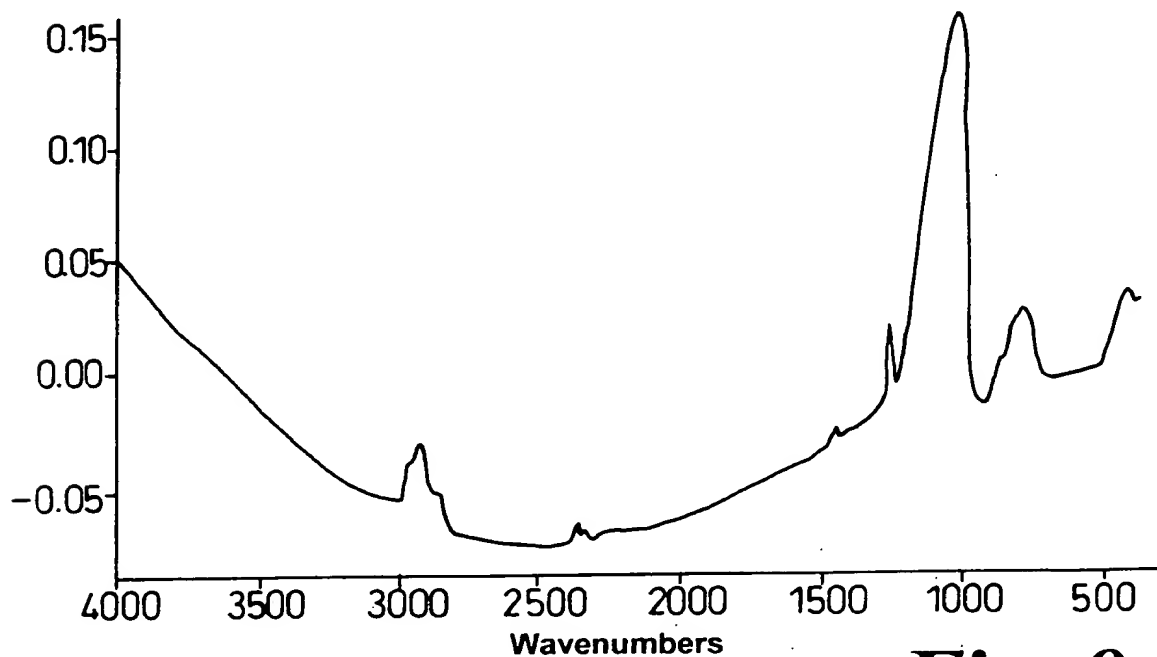
Fig. 7 (Part 3 of 3)

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1.) 800CHMMS, 0.4g/min H2O2, 900mT, 250W as deposited

**Fig. 8**

2.) 800Sccm CHMMS, 0.4g/min H2O2, 900mT, 500W

CHMMS, 2
CHMMS + H2O2 + PLASMA**Fig. 9**

100-375000-1000000

100-375000-1000000

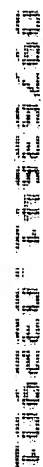
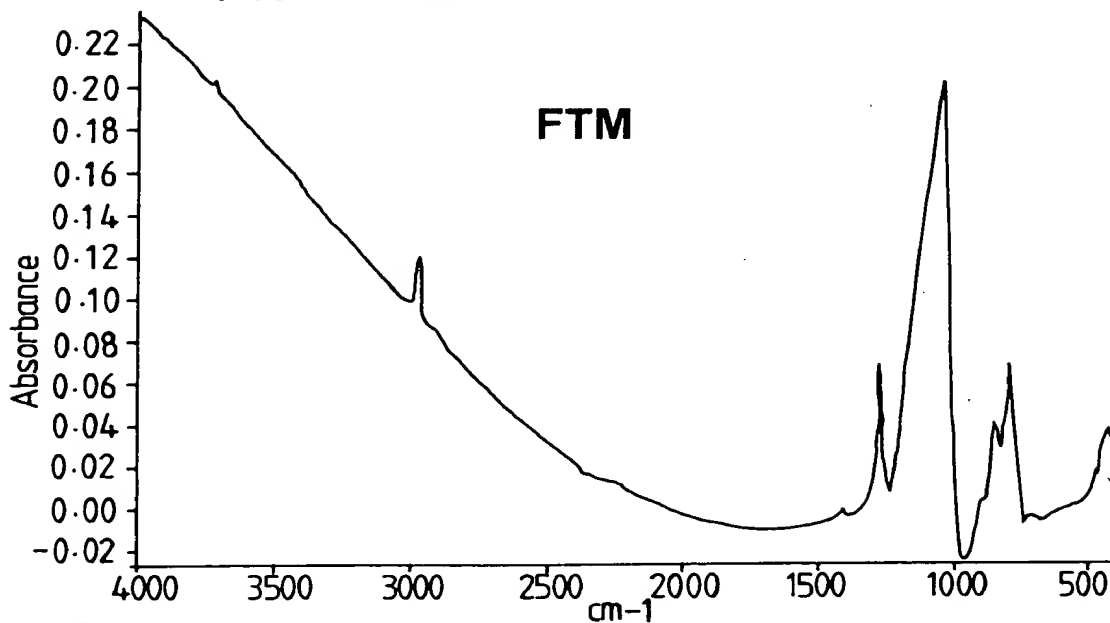


Fig. 10

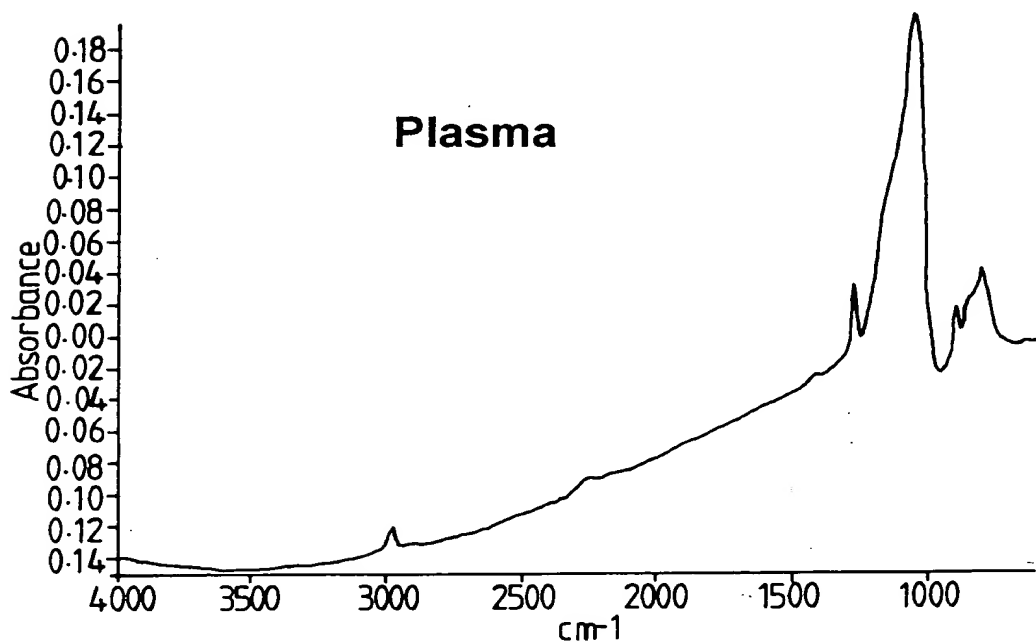
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TMS / O₂ Process

FTM v Plasma Treatment – FTIR



SiC/SiO :	0.0504
SiH/SiO :	0.0279
CH/SiO :	0.0279



SiC/SiO :	0.026
SiH/SiO :	0.019
CH/SiO :	0.0220

Fig 11

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Film Thickness and Refractive Index for TMS/O₂ Films
FTM vs. Plasma Treatments

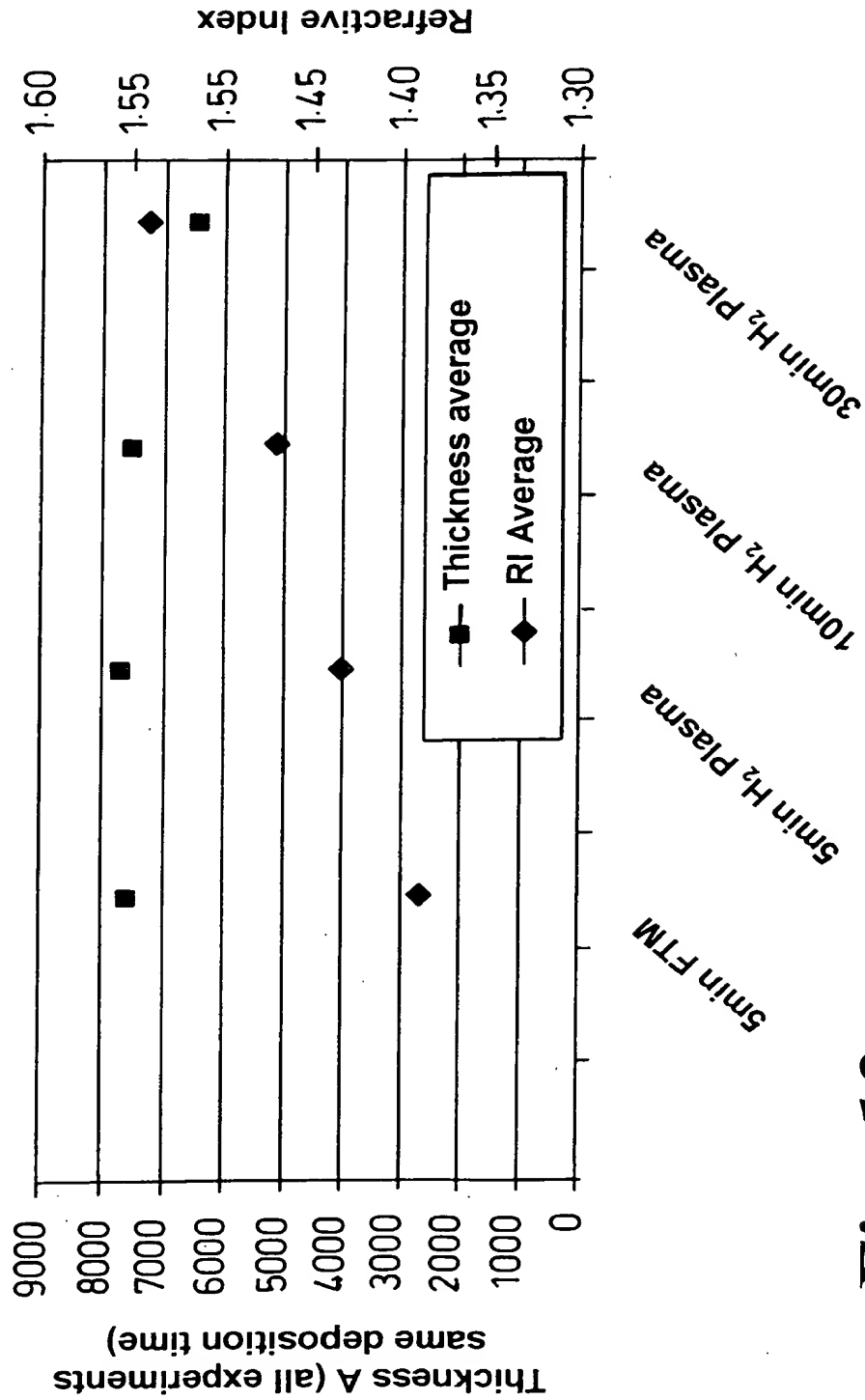


Fig. 12

FOUO 44323200

TMS / O₂ Process FTM Treatment – FTIR – oxidising strip resistance

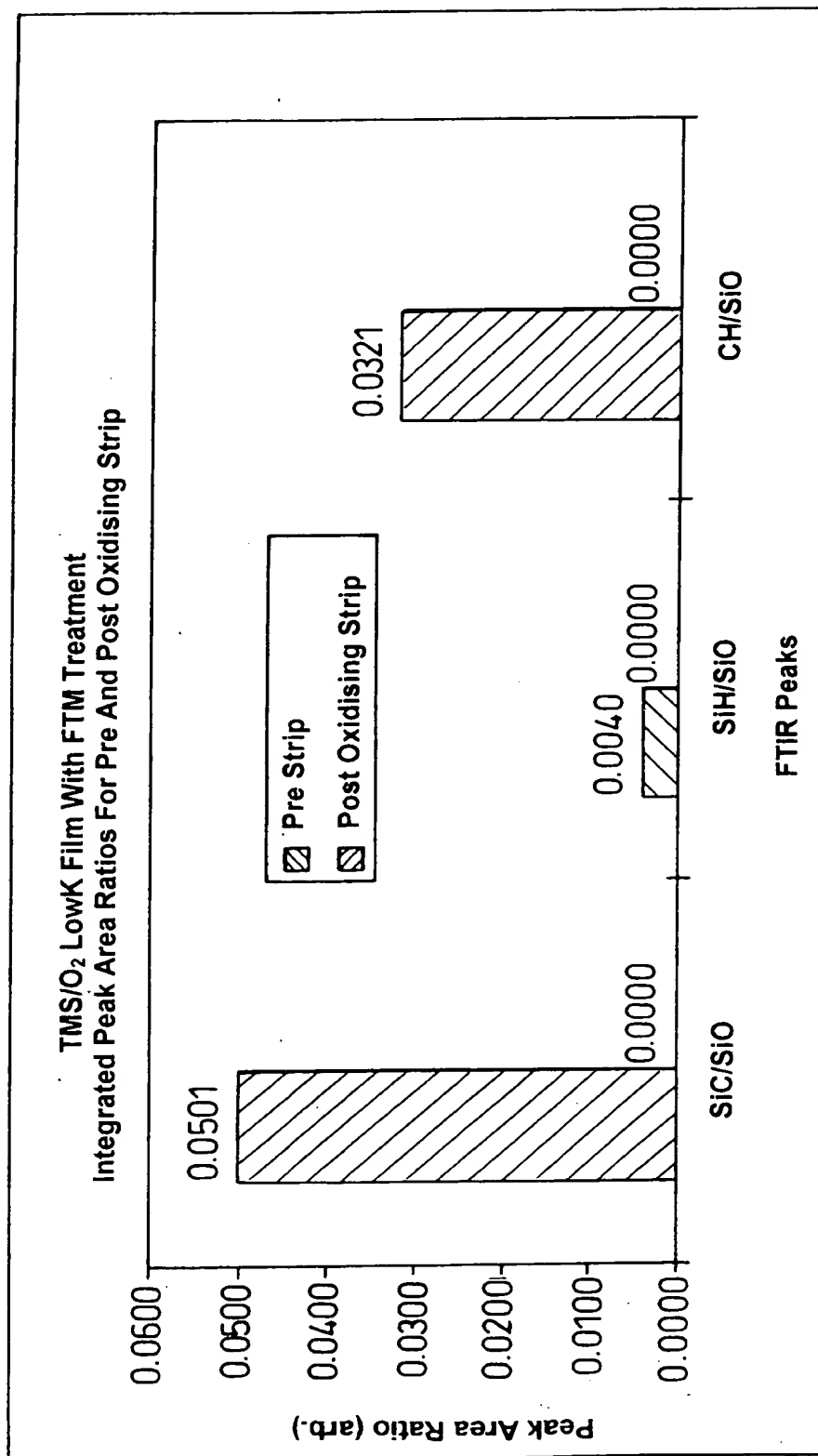


Fig 13

TMS / O₂ Process **FTM Treatment – FTIR – oxidising strip resistance**

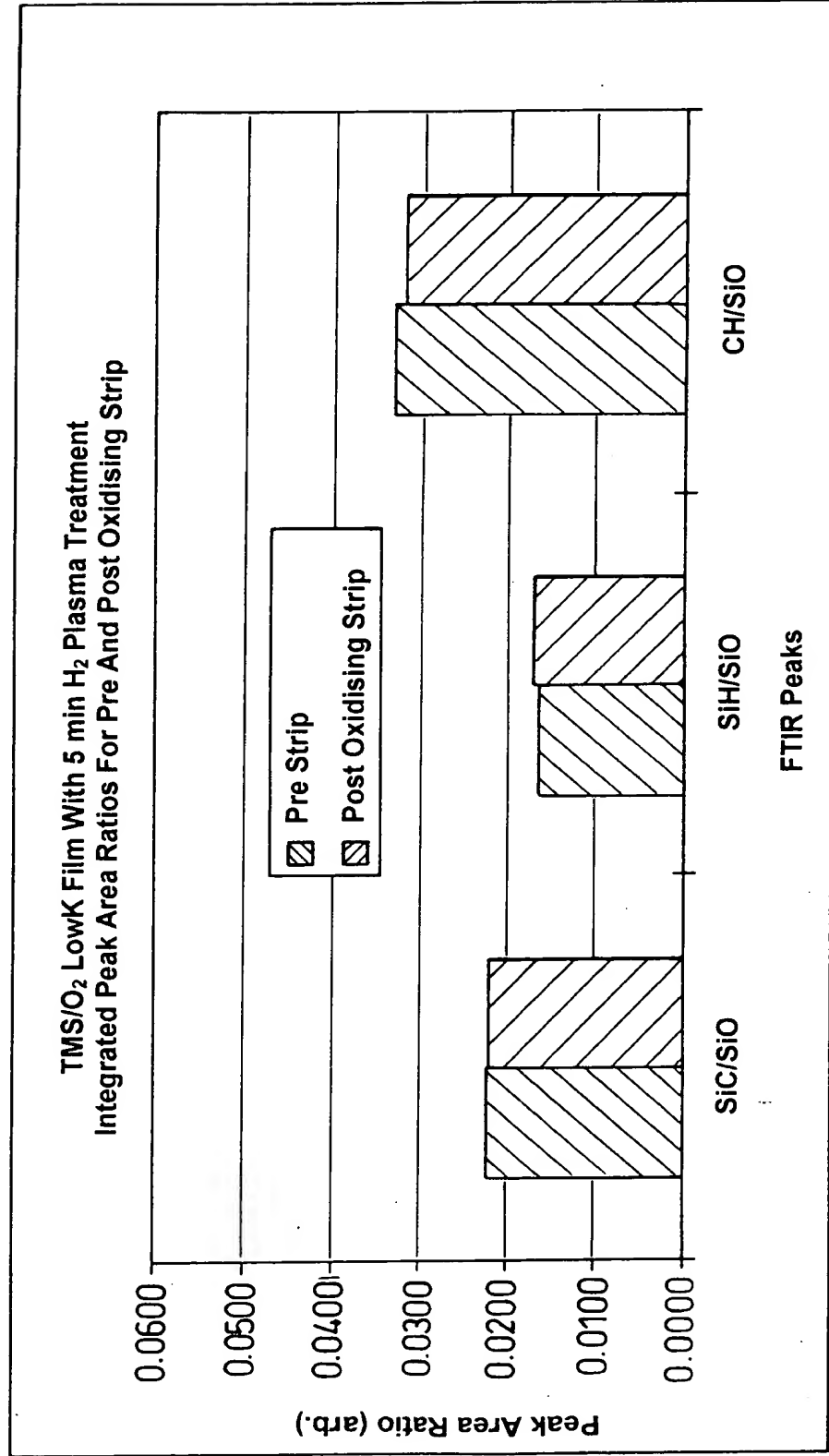
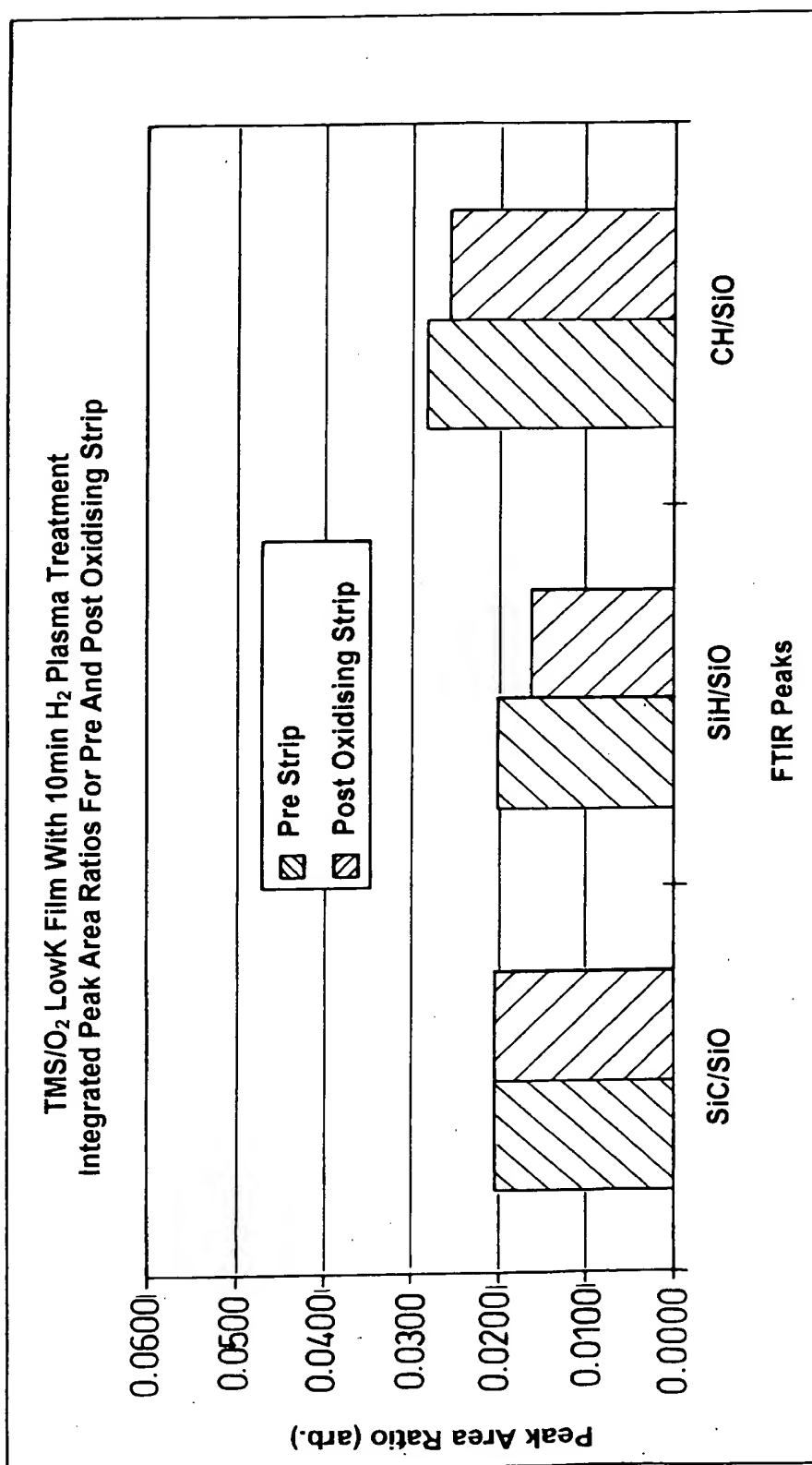


Fig 14

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TMS / O₂ Process
FTM Treatment – FTIR – oxidising strip resistance

*Fig. 15*

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TMS / O₂ Process FTM v Treatment stress – oxidising strip resistance

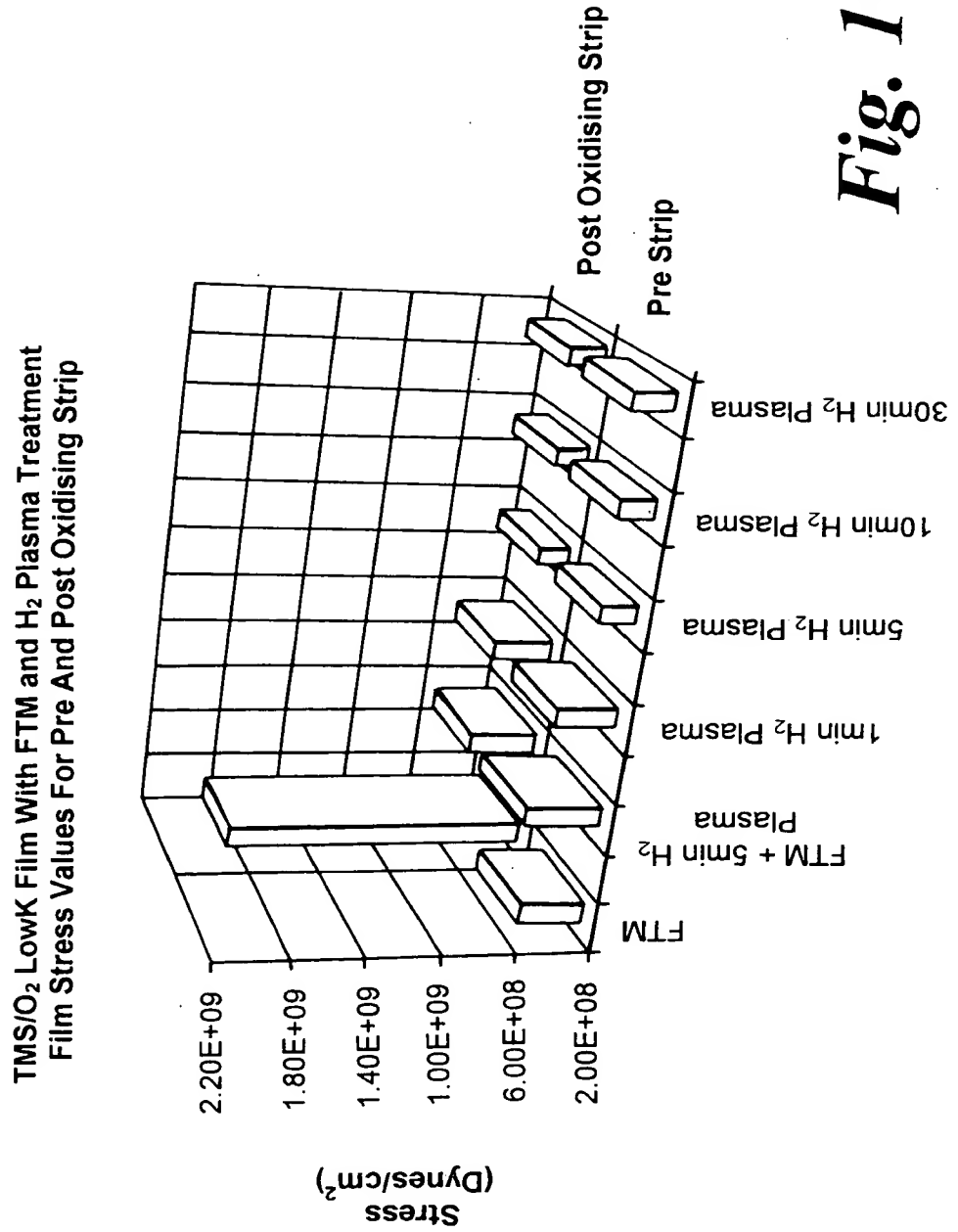


Fig. 16

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TMS / O₂ Process Plasma Treatment – Dielectric constant

Dielectric Constant Values For TMS/O₂ Films
FTM and H₂ Plasma Treatments

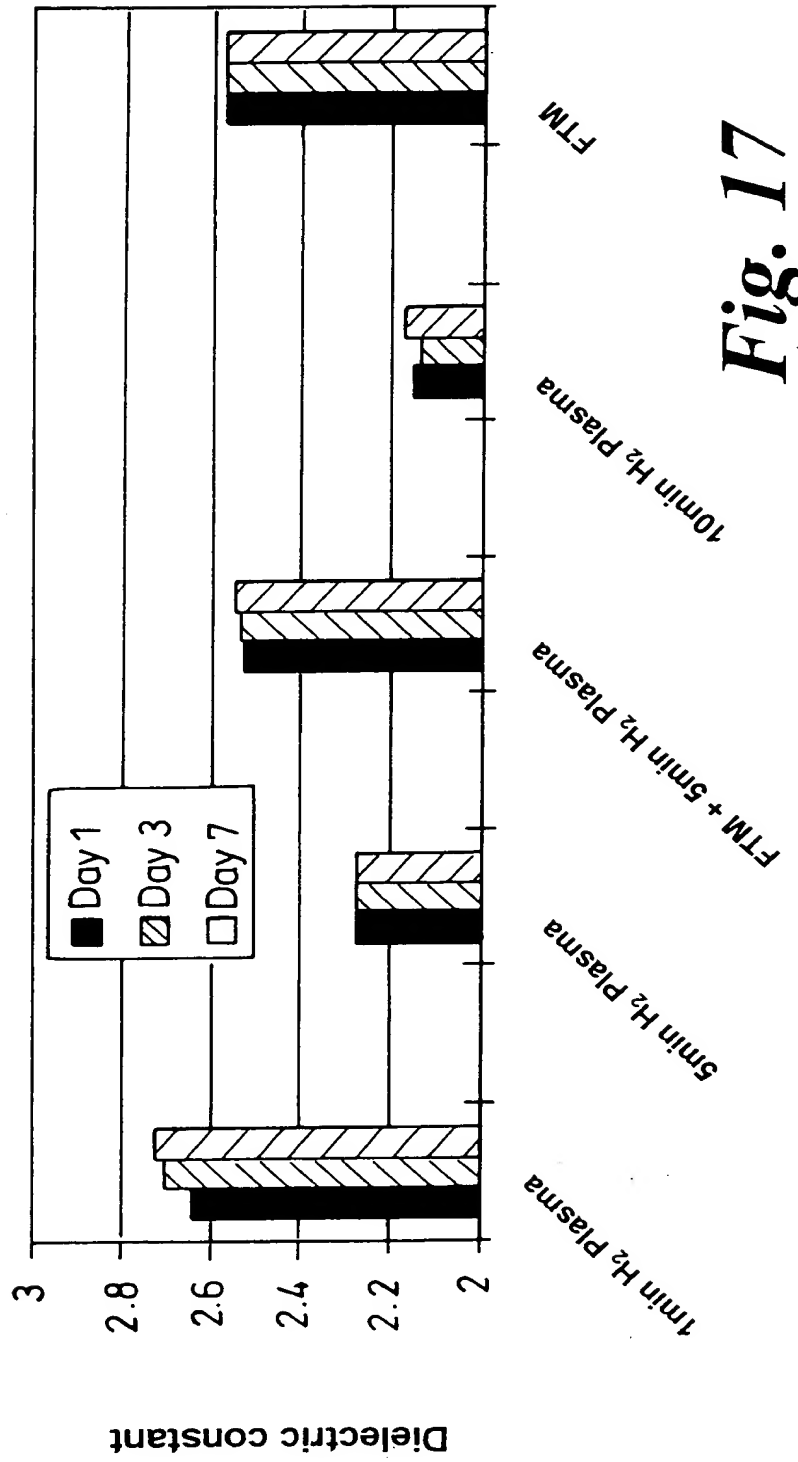


Fig. 17

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Dielectric Constant For TMS/O₂ Films
FTM and H₂ Plasma Treatments

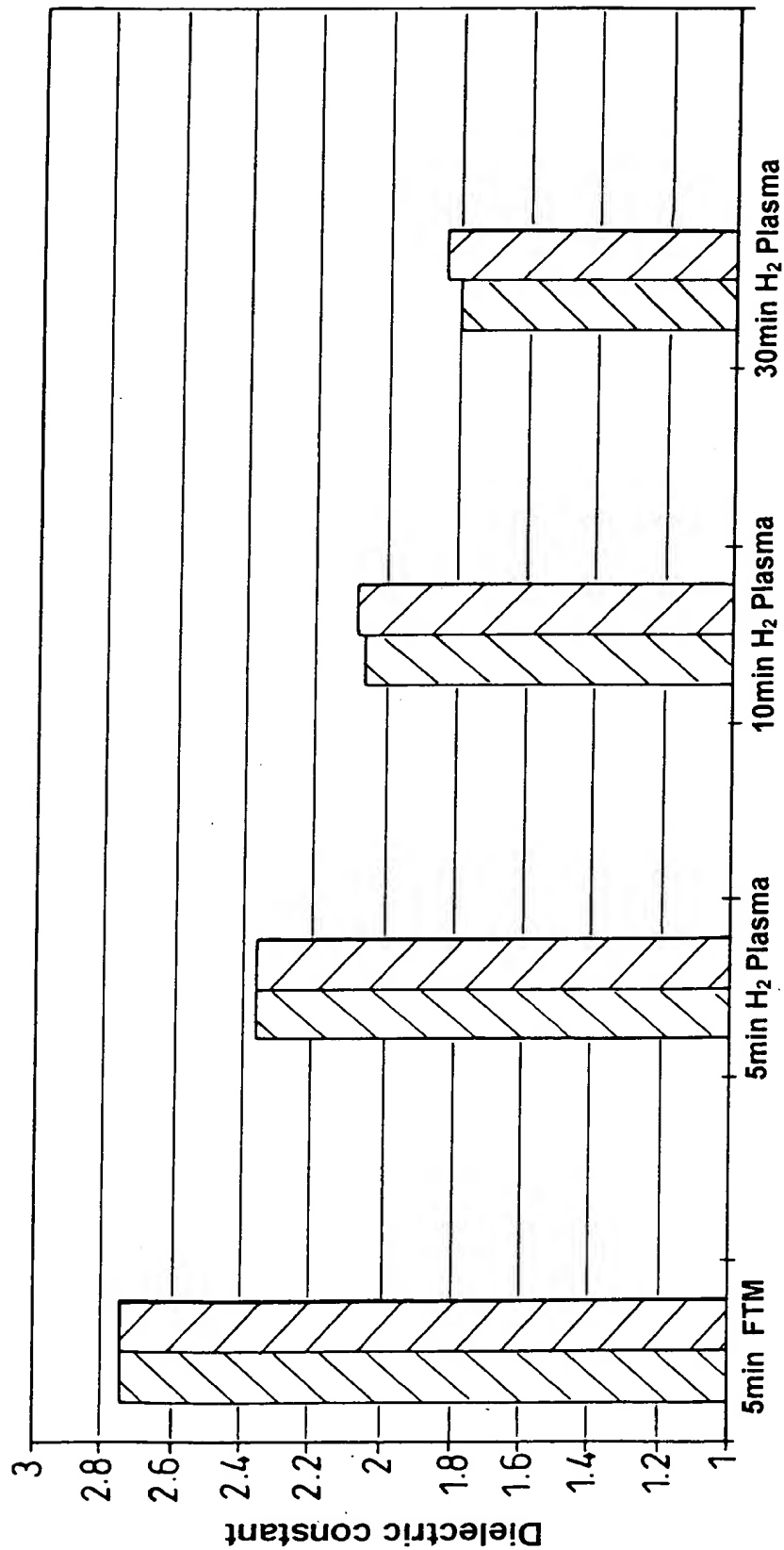


Fig 18

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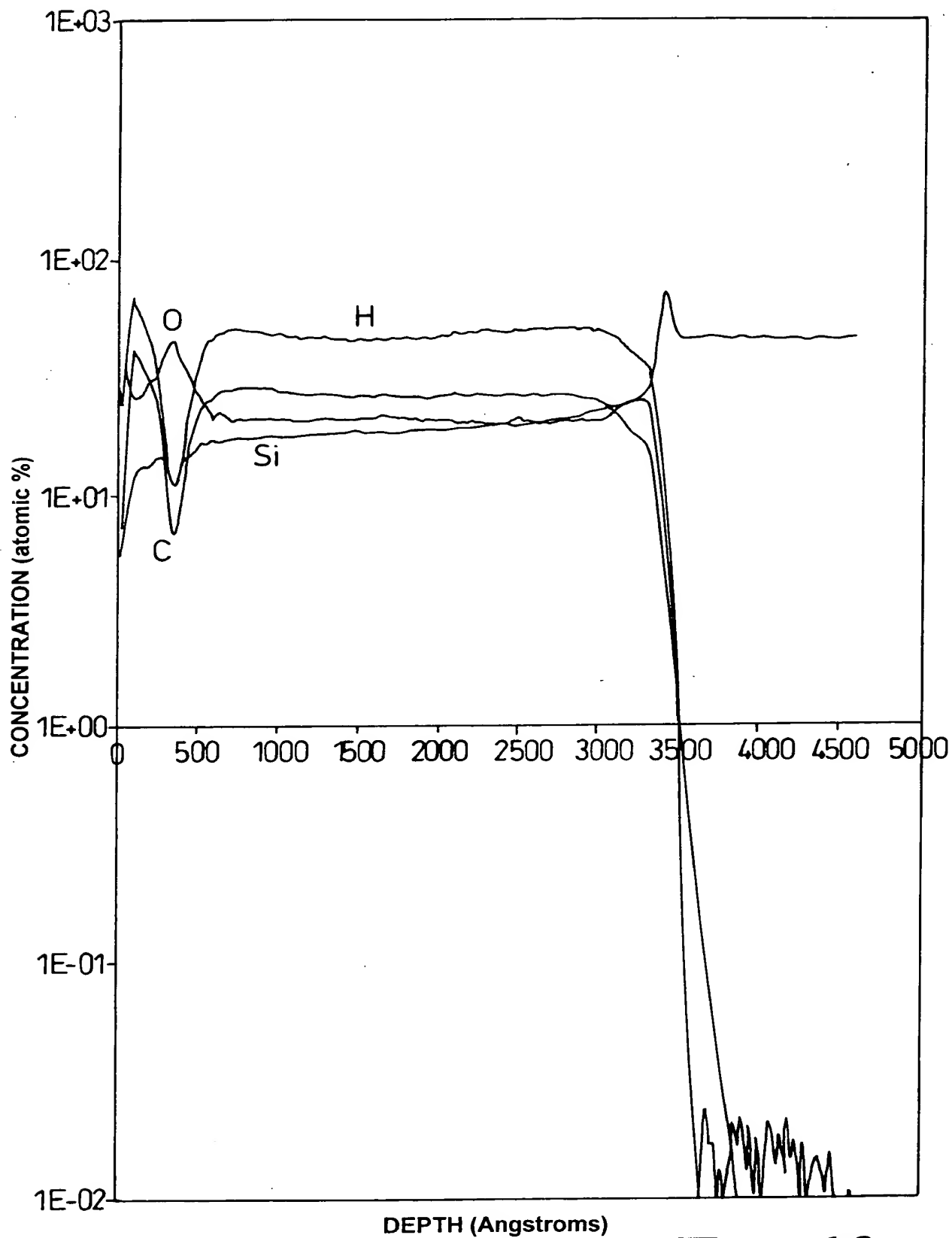


Fig. 19